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BRIEF COMMUNICATION

In vitro induced androgenesis in *Melandrium album*

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Abstract

Haploid and dihaploid female and rare dihaploid male plants were produced in *Melandrium album* through *in vitro* induced androgenesis. In the seed progeny obtained from cross-hybridization between dihaploid androgenic males (supermales) and standard females only male plants were observed. The microspores containing Y chromosome gave rise to supermales.

Induced androgenesis in *Melandrium album* (Miller) Garcke (a dioecious species with strict genetic determination of male and female individuals) gives new possibilities for the study of sexuality and heredity of sex linkage properties at haploid and polyhaploid levels. Male plants produce microspores with heteromorphic sex chromosomes X or Y. The presence of Y chromosome is a primary condition for male plants development in *Melandrium*. The ratio between X chromosomes and autosomes ranging between 0.5 and 1.5 in the plants with Y chromosome has no effect on sex in *Melandrium* (Warmke 1946, Westergaard 1958, Nigtevecht 1966, Ye *et al.* 1991).

The first records induced androgenesis in *Melandrium* (Ye *et al.* 1990) refered to the development of female plants only. The donor plants with higher androgenic responsiveness were preferably used for further experiments. Veuskens *et al.* (1992) assume that androgenic embryogenesis requires the presence of the X chromosome. Our experiment was aimed at induction and harvest of adequate number of androgenic haploids and dihaploids from a wide spectrum of donor plants.

The donor plants were grown from seeds collected in wild populations. Flower buds (length 3 to 4 mm) were equally taken from all the donor plants and surface sterilised. Immature anthers exstirpated in the uninucleate microspore phase were cultured in parallel on three modifications of the media according to Murashige and

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Skoog (1962), Gamborg *et al.* (1968), Chu *et al.* (1978), and on the medium BY S 30 (Ye *et al.* 1990). Evaluation was made of number of anthers with microsporial calluses, with embryoids and with green plants, respectively. Ploidy of the regenerants was detected according to the caryotype at somatic (in root apex cells) as well as gametic level (during sporogenesis) by the Feulgen staining method. The microsporic origin of diploid males was confirmed by cross-hybridization with standard females. A total of 19, 316 anthers was cultured in the first experiment.

The mean percentage of androgenic responsive anthers was 1.1. The best effects were registered on the medium of Chu (1978) with 4.4 mg dm^{-3} 2,4-dichlorophenoxyacetic acid (2,4-D). Complete green androgenic plants were obtained in 0.28 % of the cultured anthers. The ratio between induced female and male regenerant at the level of flowering plants equalled to 51:3. About 40 % of female regenerants were spontaneously polyhaploid (dihaploids with fertile flowers). There were great differences in flower (sixpartite, changes in shape of sepals and petals) and leaf (width, shape, colour) morphology, anthocyanin content, plant habitus and plant ontogeny (early and late flowering, without flowering) among female androgenic plants. At the same time the majority of androgenic plants exhibited a high offshoot capacity. Androgenic male plants were dihaploids only showing fast development in the anther culture. There were only male plants in the seed progeny obtained through cross-hybridization between dihaploid androgenic males and standard females (Table 1).

Table 1. Cross-hybridization of supermales and a standard male with standard females in *Melandrium album* (June 6, 1992).

Cross-hybridization	Total number of seed progeny	Number of flowering plants	Number of males	Number of females
Supermale No 1 × standard female No 1	35	31	31	0
Supermale No 1 × standard female No 2	5	2	2	0
Supermale No 2 × standard female No 3	22	16	16	0
Supermale No 2 × standard female No 4	29	19	19	0
Supermale No 2 × standard female No 5	24	17	17	0
Total	115	85	85	0
Standard male × standard female (control)	281	146	80	66

Lower frequency of induced androgenesis in *Melandrium* contrary to that described in literature (Ye *et al.* 1990, Veuskens *et al.* 1992) can be explained by equal representation of a greater number of donor plants without preference of androgenic responsive genotypes. It seems evident that the sporophytic development of microphores with the Y chromosome requires different conditions of induction (genotypic specificity of donor plants or different ontogenetic stage of pollen development), hence the use of a higher number of donor plants should give better results as compared to experiments comprising one or a few androgenic responsive individuals. This opinion is supported by the fact that induced male androgenic plants were dihaploid.

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